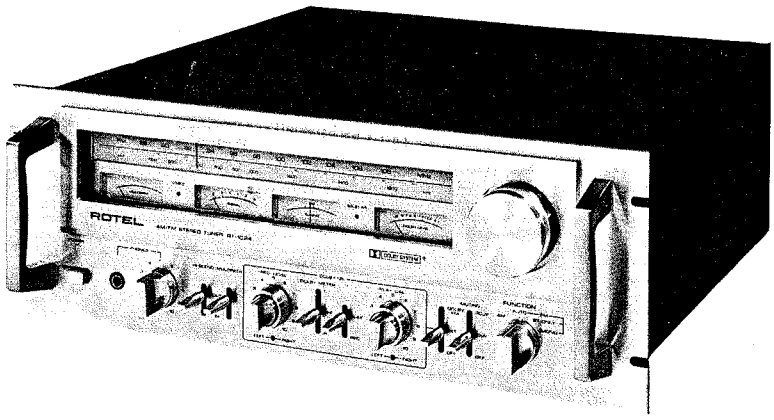
Quality. Uncompromised.

ROTEL®

Technical Manual

AM/FM STEREO TUNER

RT-1024



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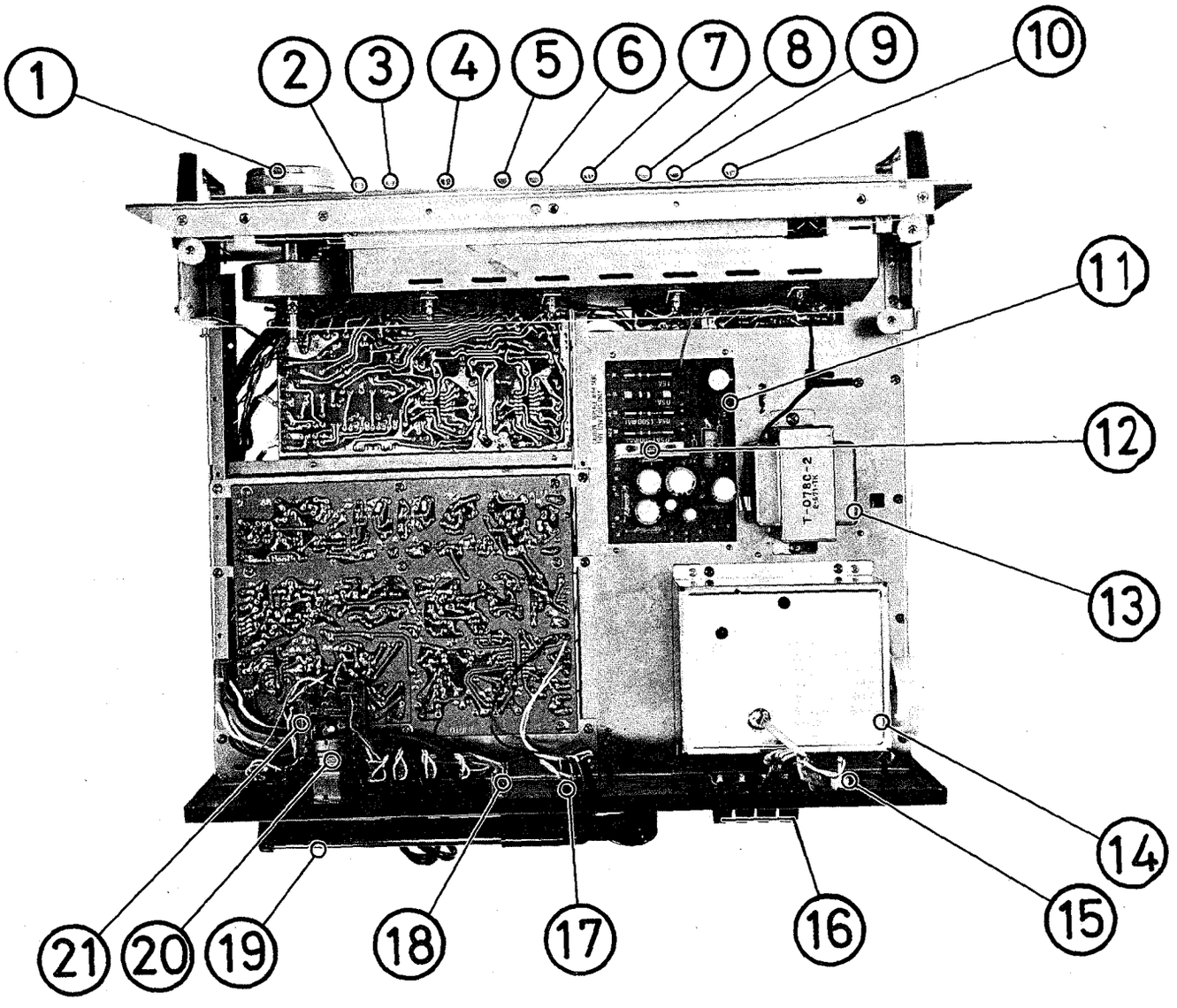
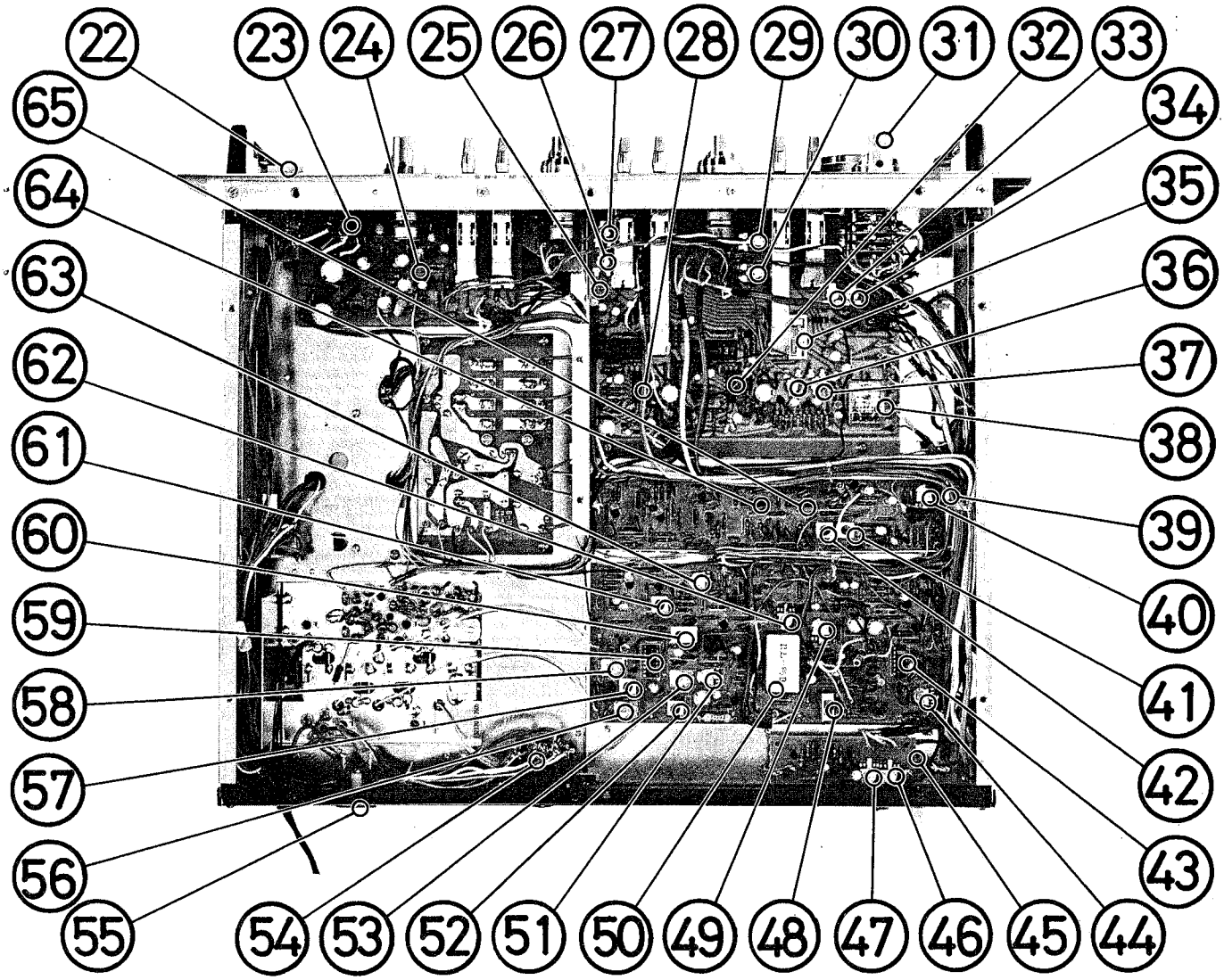
Serial Nos. Beginning
NA-26631
R-27251

CHASSIS LAYOUT (TOP VIEW)



1. TUNING KNOB
2. FM MUTING SWITCH
3. DOLBY SWITCH
4. PLAY LEVEL CALIBRATOR
5. PLAY/REC. SWITCH
6. DOLBY METER SWITCH
7. REC. LEVEL CONTROL
8. FM MULTIPATH SWITCH
9. HI-BLEND SWITCH
10. HEADPHONES LEVEL CONTROL
11. POWER SUPPLY PCB
12. Q901, STABILIZER
13. T001, POWER TRANSFORMER
14. AM/FM FRONT END
15. FM ANTENNA 75Ω SOCKET
16. AM/FM ANTENNA TERMINAL STRIP
17. FM 4-CH. DET. OUTPUT JACK
18. 400Hz TONE OSC SWITCH
19. L003, AM ANTENNA COIL
20. OUTPUT LEVEL CONTROL
21. VARIABLE OUTPUT AMP. PCB

CHASSIS LAYOUT (BOTTOM VIEW)



22. POWER SWITCH
23. HEADPHONES JACK
24. HEADPHONES AMP. PCB
25. DOLBY NR AMP. PCB
26. VR807, DOLBY METER CAL. (L-CH.)
27. VR808, DOLBY METER CAL. (R-CH.)
28. IC801, L-CH. DOLBY NR IC
29. VR804, DOLBY LEVEL CAL. (R-CH.)
30. VR803, DOLBY LEVEL CAL. (L-CH.)
31. FUNCTION SELECTOR
32. IC802, R-CH. DOLBY NR IC
33. VR810, FM MUTING, 30μV LEVEL ADJ.
34. VR809, FM MUTING, 10μV LEVEL ADJ.
35. RY801, DOLBY EQUALIZER SWITCH RELAY
36. VR805, DOLBY LEVEL FOR FIXED OUTPUT ADJ. (L-CH.)
37. VR806, DOLBY LEVEL FOR FIXED OUTPUT ADJ. (R-CH.)
38. RY802, DE-EMPHASIS & OUTPUT SWITCH RELAY
39. IF AMP. PCB
40. VR1004, FM TUNING METER CAL.
41. L1003, FM DISC. COIL (SEC.)
42. L1004, FM DISC. COIL (PRI.)
43. IC1003, FM MPX DECODER
44. VR1003, FM MPX 19kHz ADJ.
45. 400Hz TONE OSC PCB
46. VR701, 400Hz TONE LEVEL ADJ. (L-CH.)
47. VR702, 400Hz TONE LEVEL ADJ. (R-CH.)
48. DE-EMPHASIS SELECTOR
49. VR1005, FM STEREO SEPARATION ADJ.
50. L1006, FM MPX LOW-PASS FILTER
51. VR201, AM SIGNAL METER CAL.
52. L205, AM RF COIL
53. CT203, AM RF TRIMMER
54. VOLTAGE SELECTOR
55. AC OUTLET
56. CT201, AM OSC TRIMMER
57. L204, AM OSC COIL
58. CT202, AM ANT TRIMMER
59. IC201, AM CONV. & IF AMP. IC
60. L206, AM IFT
61. L1001, FM IFT
62. VR1002, FM STEREO IND. LEVEL ADJ.
63. VR1001, FM SIGNAL METER CAL.
64. IC1001, FM 1ST IF AMP.
65. IC1002, FM 2ND IF AMP.

AM ALIGNMENT PROCEDURE

Instruments: AM Signal Generator and AC VTVM.
Notes: Set Selector Switch to AM.
Input signal must be kept as low as possible to avoid AGC action.

Step	Generator		Tuning Dial Setting	Output Indicator Connected to	Adjust	Adjust for
	Coupling	Frequency				
1	Pin No. 6 (on IF board) through a 0.01mfd capacitor.	455kHz (400Hz 30% mod.)	Non interfering at low end of scale.	AC VTVM to FIXED-OUT jack.	L206 (on IF board)	Maximum reading on VTVM.
2	Connect to short loop of wire. Radiate signal into ferrite loopstick antenna.	600kHz (400Hz 30% mod.)	600kHz		L204 (OSC) L205 (RF) (on IF board) and L003 ANT coil	
3		1,400kHz (400Hz 30% mod.)	1,400kHz		CT201 (OSC trim.), CT203 (RF trim.) & CT202 (ANT trim) (on IF pcb)	
4	Repeat steps 2 and 3 until no further improvement is noticed.					

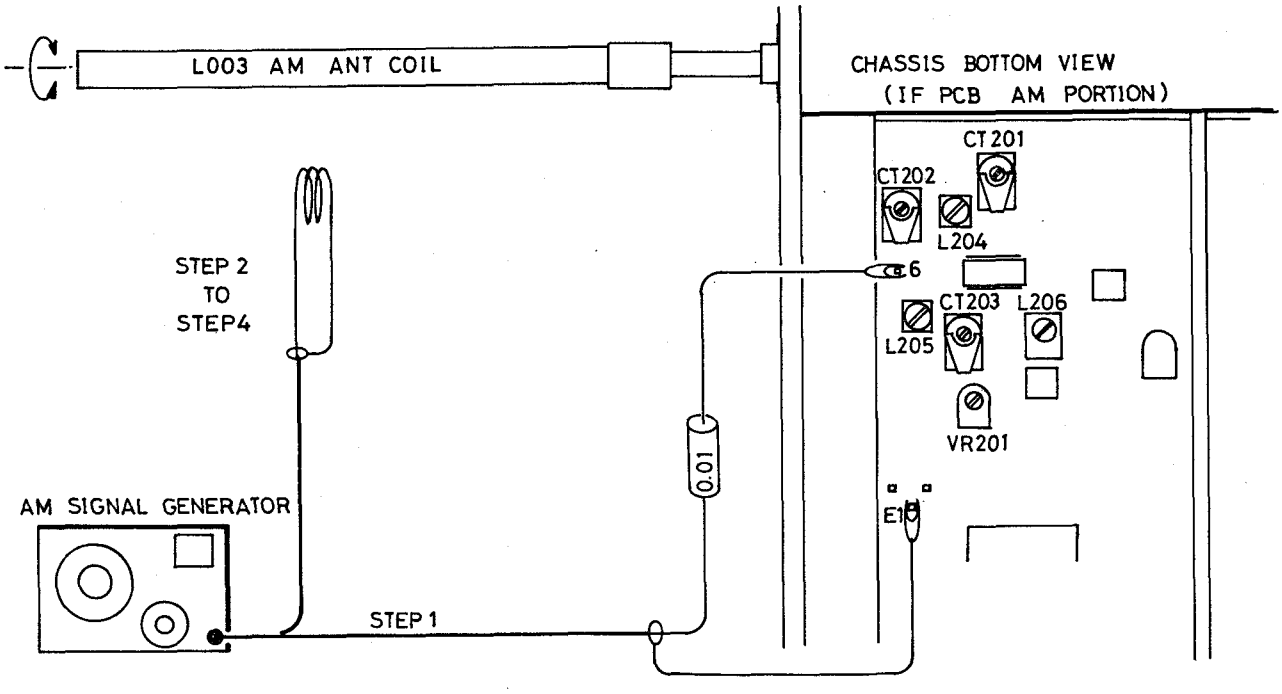


FIG. 1-1. AM ALIGNMENT PROCEDURE

AM SIGNAL METER CALIBRATION

1. Connect AC VTVM to Fixed Output terminal. Apply 1,000kHz signal (400Hz, 30% Mod.) into AM ANT COIL from AM Signal Generator and raise ANT input level until output signal reaches saturation point. See Fig. 1-2.
2. While in state of (1), adjust potentiometer VR201 (on IF pcb) so that Signal Meter reads "9".

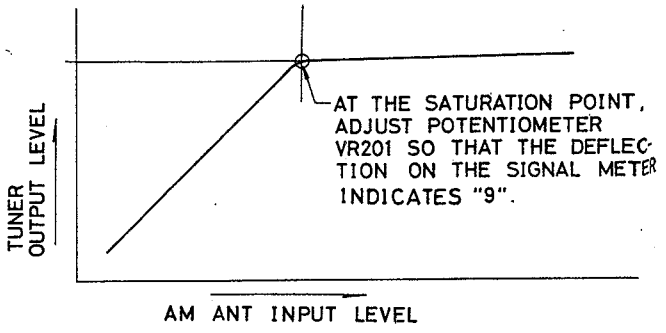

TUNER OUTPUT LEVEL
AT THE SATURATION POINT, ADJUST POTENTIOMETER VR201 SO THAT THE DEFLECTION ON THE SIGNAL METER INDICATES "9".
AM ANT INPUT LEVEL

FIG. 1-2. AM SIGNAL METER CALIBRATION

FM ALIGNMENT PROCEDURE

Instruments: FM Signal Generator, Oscilloscope and HD Analyzer

- Set Function Selector to "FM AUTO".

1. Connect Oscilloscope and HD Analyzer to Fixed Output terminal. And tune the Dial to a position where no broadcasting signal is coming in and receive clean noise. Keeping this position, short the primary side of L1003 (to cut off the noise) and adjust potentiometer VR1004 so that pointer needle rests at the center of FM Tuning Meter. See Fig. 2-1.
2. Next, open the shorted primary side of L1003 and receive 90MHz signal from FM Signal Generator. Adjust L1004 to minimize distortion. Adjust IFT on front end to maximize sensitivity (maximum output).
3. Adjust FM OSC Coil "LO" on front end to get precise 90MHz signal from FM Signal Generator, with the dial tuned to 90MHz. At the same time, adjust each of LR3, LR2, LR1 and LA coils to obtain maximum sensitivity.
4. Next, switch frequency to 106MHz and adjust TCo for correct reception with the dial tuned to 106MHz. At the same time, adjust TCR3, TCR2, TCR1 and TCA to obtain maximum sensitivity.
5. Repeat Steps 3 and 4 to obtain correct tracking.
6. After completing tracking adjustment, tune in to any frequency from FM Signal Generator. At this time, adjust ATT on the FM Signal Generator to get approximately 30μV ANT input level. In this state, adjust L001 to obtain maximum reading on Signal Meter . . . . . this adjustment of coil is necessary to carry out the following adjustments.

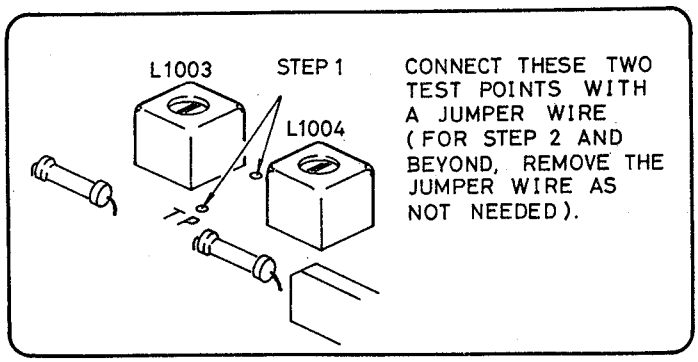

L1003
STEP 1
L1004
TP
CONNECT THESE TWO TEST POINTS WITH A JUMPER WIRE (FOR STEP 2 AND BEYOND, REMOVE THE JUMPER WIRE AS NOT NEEDED).

FIG. 2-1. IF PCB COMPONENT SIDE VIEW (FM IF PORTION)

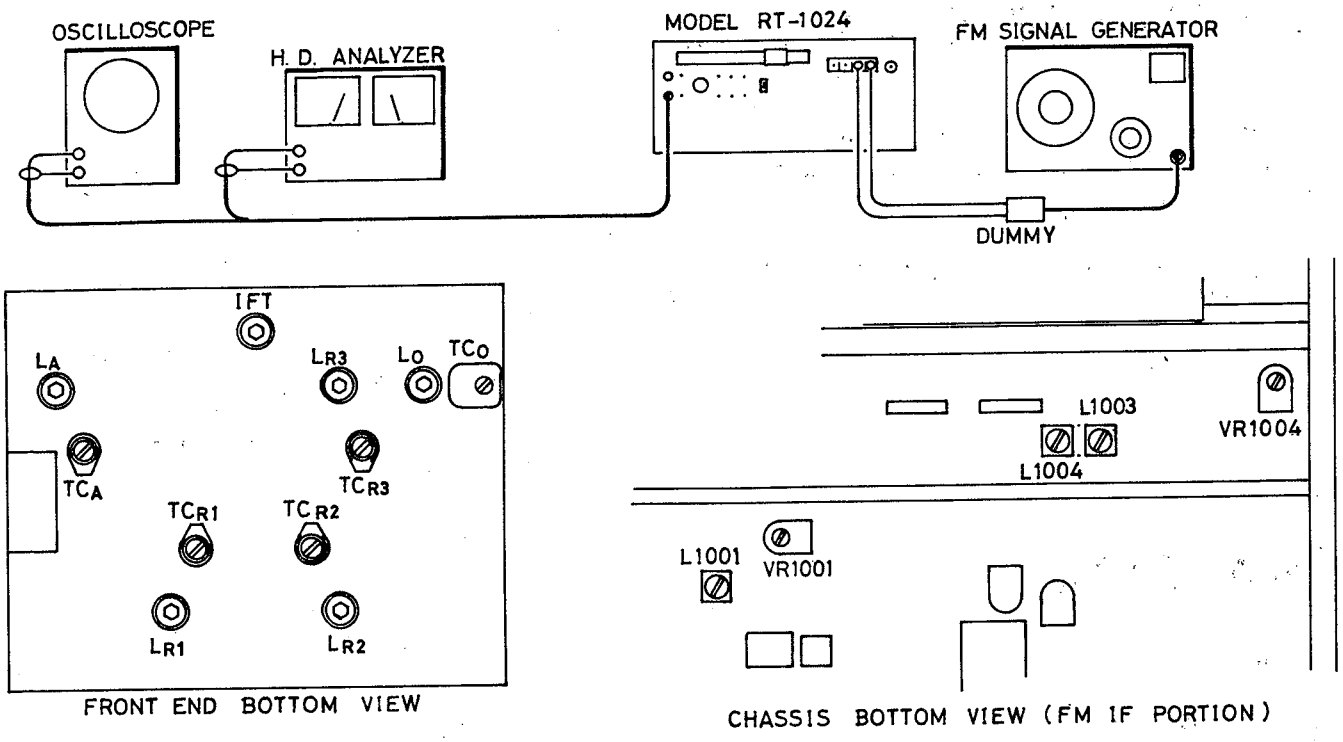


FIG. 2-2. FM ALIGNMENT HOOK-UP

FM SIGNAL METER LEVEL ADJUSTMENT

Note: The FM IF and RF alignment must be completed before attempting this alignment.

Instrument: FM Signal Generator

1. Set the Signal Generator frequency to 90MHz, and set the FM antenna input level to 1mV by controlling the attenuater of Signal Generator.
2. Receive the signal from Signal Generator, and adjust potentiometer VR1001 (on IF pcb) so that the Signal Meter indicates toward "9" on the scale.

FM MPX ALIGNMENT PROCEDURE

Note: The FM IF alignment must be completed before attempting this MPX alignment. Poor FM IF alignment will result in poor MPX alignment.

Instruments: FM Stereo Generator, AC VTVM and Oscilloscope.

- Set Function Selector to FM Auto.
- Set Muting and Hi-Blend Switch to OFF.
- Set potentiometers VR1002, 1003 and 1004 to their mid-position.

1. Connect AC VTVM and Oscilloscope to Fixed Output (Right channel) jack. And connect FM Stereo Generator to FM antenna terminals, and set the frequency at 98 MHz (if a disrupting signal appears, select another frequency).
2. Feed the FM signal whose MPX has been varied into FM antenna terminals.
   MPX Variation:
   Pilot Tone 5%
   Modulation Signal, 1kHz, (Left) 90%
3. Set the antenna input level to 5μV by controlling the attenuator of Stereo Generator. And adjust potentiometer VR1002 (on IF pcb) so that the FM Stereo Indicator just lights up.
4. Change the antenna input level to 1mV and pilot tone modulation to 10%.
5. Adjust potentiometer VR1003 (on IF pcb) so that MPX circuit begins stereo operation. <Both side ranges of potentiometer are for Mono operation (A and B in the Figure). To set to center stereo operation zone, turn screw from the side having less distortion to center, and fix potentiometer at the point where mono switches to stereo.>
6. Then, adjust potentiometer VR1004 (on IF pcb) so that the leakage of signal into Right channel is minimum.
7. Switch the modulation of FM Stereo Generator from Left to Right, and reconnect oscilloscope and AC VTVM to Left channel Fixed Output jack. Then make certain the level of signal leakage into Left channel is equal to that into Right channel in preceding two items. If there is an excessive difference between leak-free effects of both channels, slightly adjust VR1004 so that the levels of signal leakage of both channels are equal.

Separation subsequent to adjustment is as follows.

Frequency	100Hz	1kHz	10kHz
Separation	35dB or more	35dB or more	30dB or more

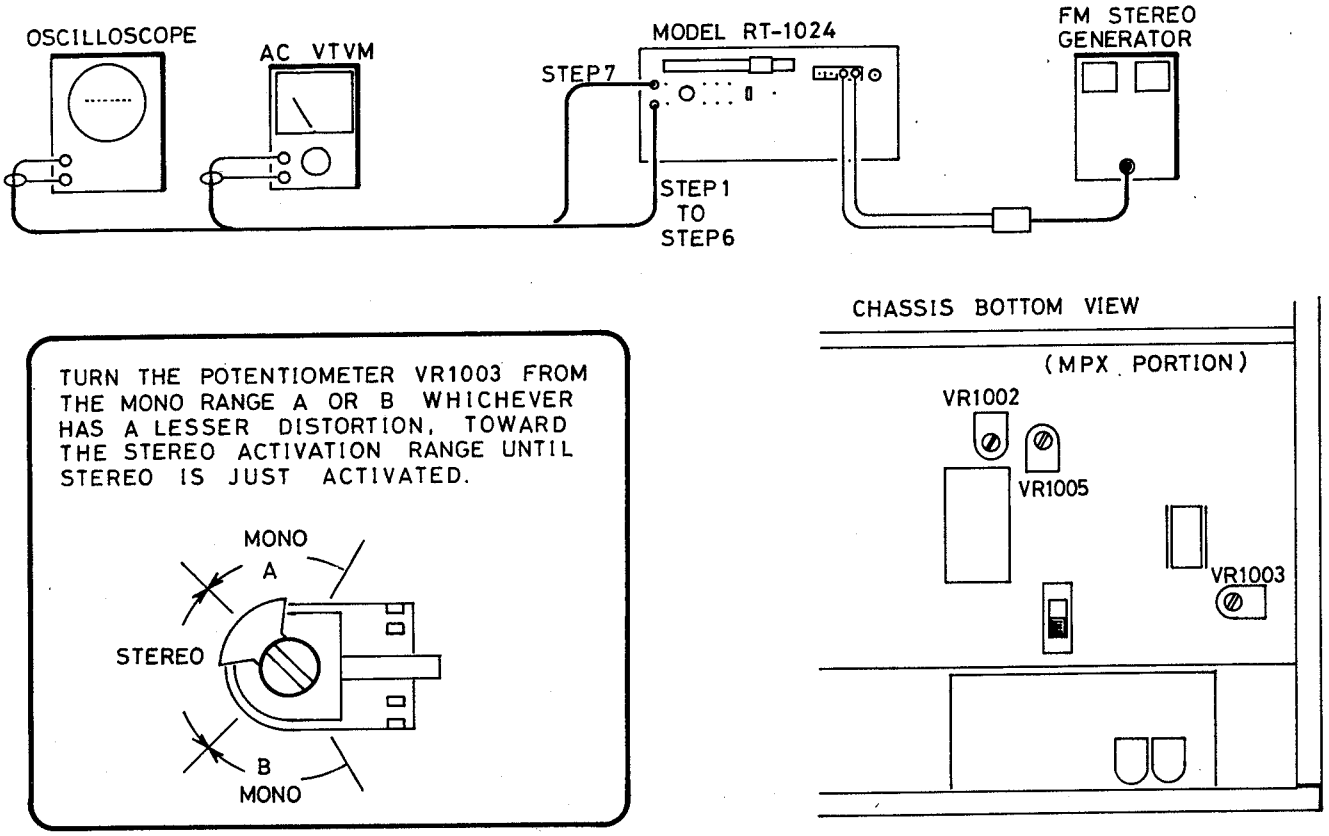


FIG. 3. FM MPX ALIGNMENT HOOK-UP

FM MUTING LEVEL ADJUSTMENT

Note: The FM IF and FM RF alignment must be completed before attempting this adjustment.

Instruments: FM Signal Generator and Oscilloscope.

- Set Function Selector to "FM".

1. Connect Oscilloscope to the Fixed Output jack (Left or Right channel) and connect the FM Signal Generator to the FM ANT terminals.
2. Set the Frequency at 98MHz and adjust Signal Generator output level to obtain antenna input level of 30μV.
3. Next, set the Muting Switch to 30μV position and adjust potentiometer VR810 (on Dolby NR Amp. pcb) so that the output waveform on scope just disappears.
4. Change the Muting Switch to 10μV position. Set the antenna input level to 10μV and adjust potentiometer VR809 (on Dolby NR Amp. pcb) so that the output waveform on scope just disappears.

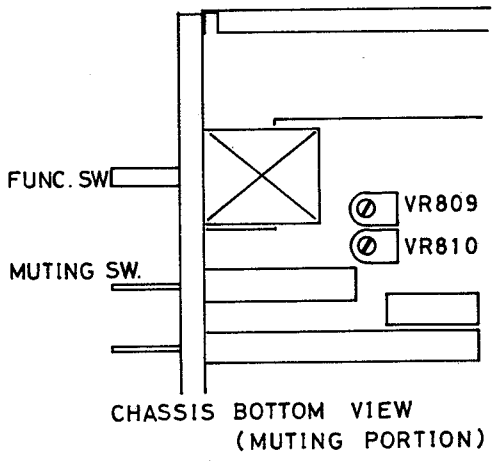


FIG. 4. FM MUTING LEVEL ADJUSTMENT

400Hz TONE LEVEL CALIBRATION

Instruments: Oscilloscope and AC VTVM.

- Set Function Selector to FM, Dolby NR Switch to EXT, Rec./Play Switch to PLAY and 400Hz Tone Switch (on rear panel) to ON.

1. Connect Oscilloscope and AC VTVM to Left channel "TO DECK" jack. And adjust potentiometer VR701 (on 400Hz OSC pcb) to obtain 580mV reading on AC VTVM. Then, set the Dolby Meter Switch to Left, and adjust potentiometer VR807 (on Dolby NR Amp. pcb) so that Dolby Level Meter indicates 0dB point.
2. Reconnect Oscilloscope and AC VTVM to Right channel "TO DECK" jack, and set the Dolby Meter Switch to Right. And adjust potentiometer VR702 (on 400Hz OSC pcb) to obtain 580mV reading on AC VTVM, and adjust VR808 (on Dolby NR pcb) so that Dolby Level Meter indicates 0dB point.

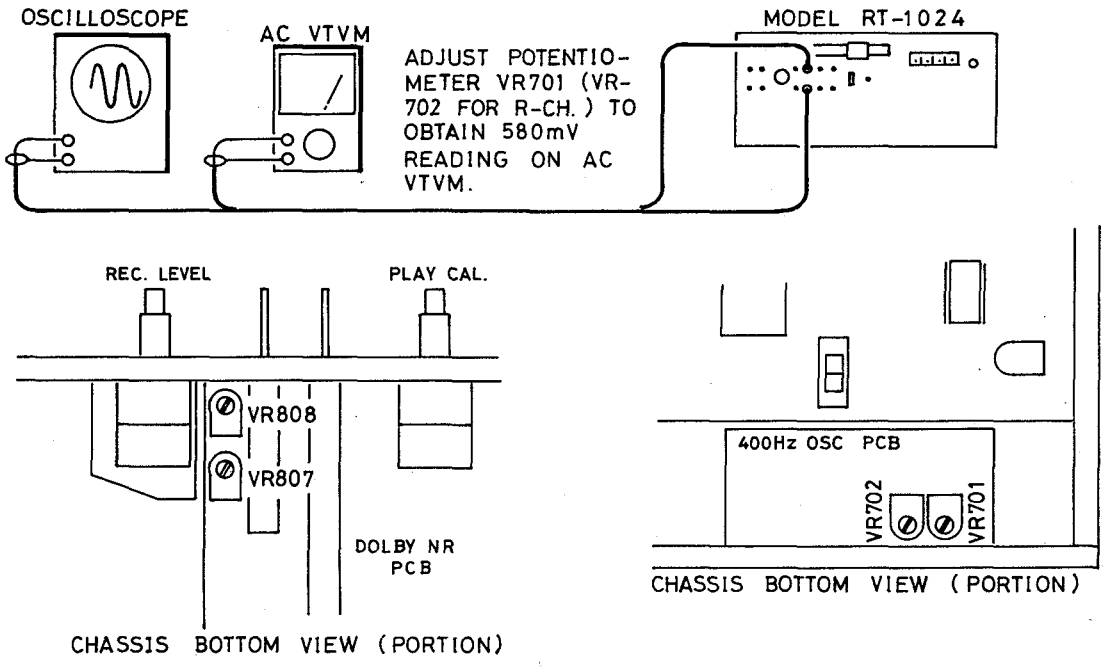


FIG. 5. 400Hz TONE LEVEL CALIBRATION HOOK-UP

FM DOLBY LEVEL CALIBRATION

Instruments: FM Signal Generator, AC VTVM and Oscilloscope

- Set Function Selector to FM and Dolby Switch to FM Dolby.

1. Connect AC VTVM and Oscilloscope to "TO DECK" jack and connect FM Signal Generator to FM antenna terminals.
   And receive the signal (400Hz 50% Mod. Mono) from FM Signal Generator.
2. Then, adjust potentiometer VR803 (on Dolby NR pcb) to obtain 580mV reading on AC VTVM.
3. Reconnect AC VTVM and Oscilloscope to Fixed Output (L-ch.) jack, and set the Dolby Switch to EXT. Then, adjust potentiometer VR805 to obtain 580mV reading on AC VTVM.
4. Repeat the above steps 2 and 3 for Right channel using potentiometers VR804 and 806 (on Dolby NR pcb).

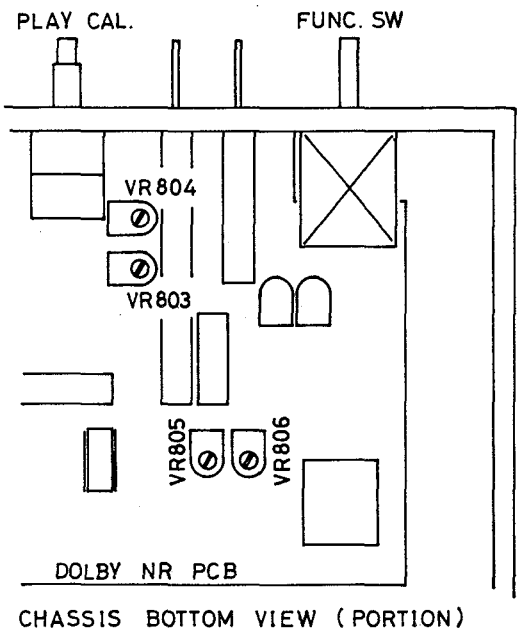


FIG. 6. FM DOLBY LEVEL CALIBRATION

TROUBLESHOOTING GUIDE

AM SECTION INOPERATIVE.

A. Measure voltage at Pin No. 9 of IF Amp. pcb (refer to circuit diagram).
   1. If there is no voltage,
      a. Function Switch connection may be faulty.
   2. If there is proper voltage,
      a. IC201 or Transistor Q202 may be faulty, or
      b. Coil L204, 205 or 003 may be faulty.

FM SECTION INOPERATIVE (Muting Switch to OFF).

A. Measure voltage at Pin No. 30 of IF Amp. pcb (refer to circuit diagram).
   1. If there is proper voltage,
      a. Transistor Q1001, 1004, 1005, 1010 or 1019 may be faulty, or
      b. IC1001, 1002 or 1003 may be faulty, or
      c. Coil L1003 or 1004 may be faulty, or
      d. Front end may be faulty.

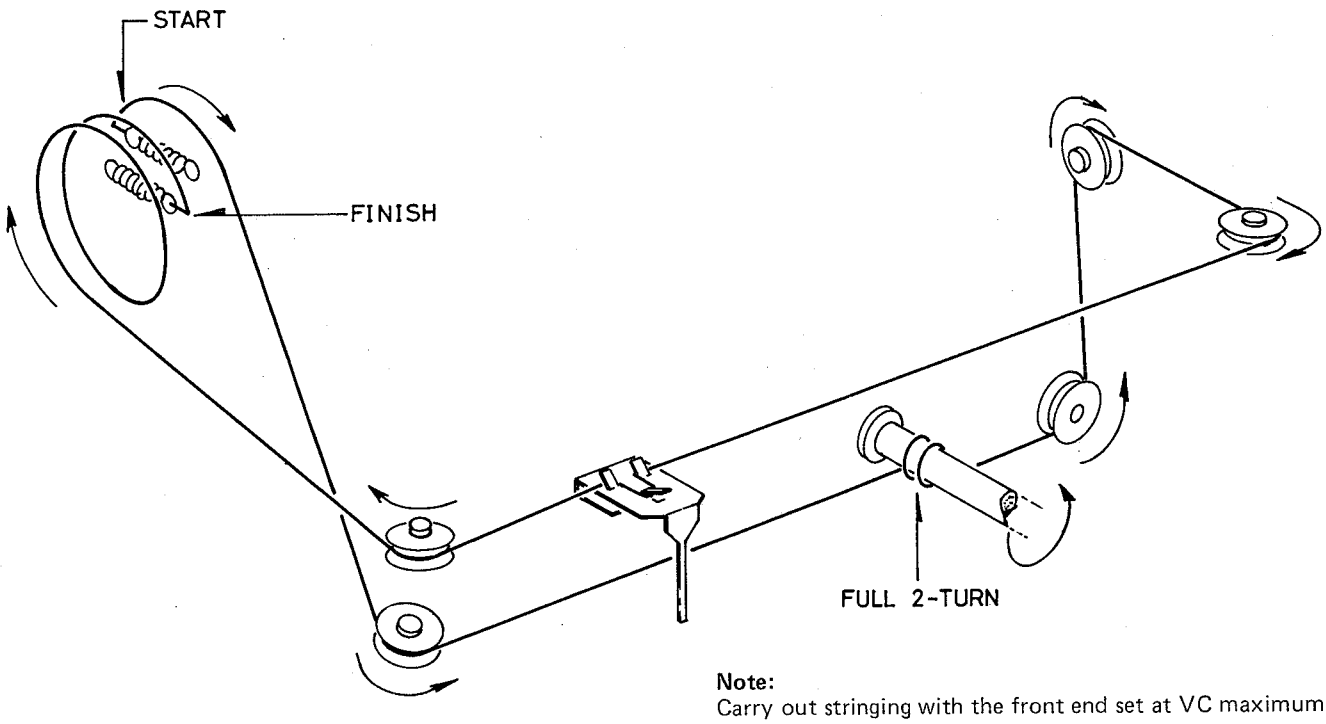
DOLBY NR SYSTEM INOPERATIVE.

A. Signal comes to output terminal from tuner when Dolby switch is set to OFF or to EXT.
   1. Relay RY802 may be faulty, or
   2. Dolby switch connection may be faulty.

B. Extension (at recording) or condensing (at playback) is not possible in high frequency range when Dolby switch is set to DOLBY FM or EXT.
   1. Relay RY801 may be faulty, or
   2. Dolby switch connection may be faulty.

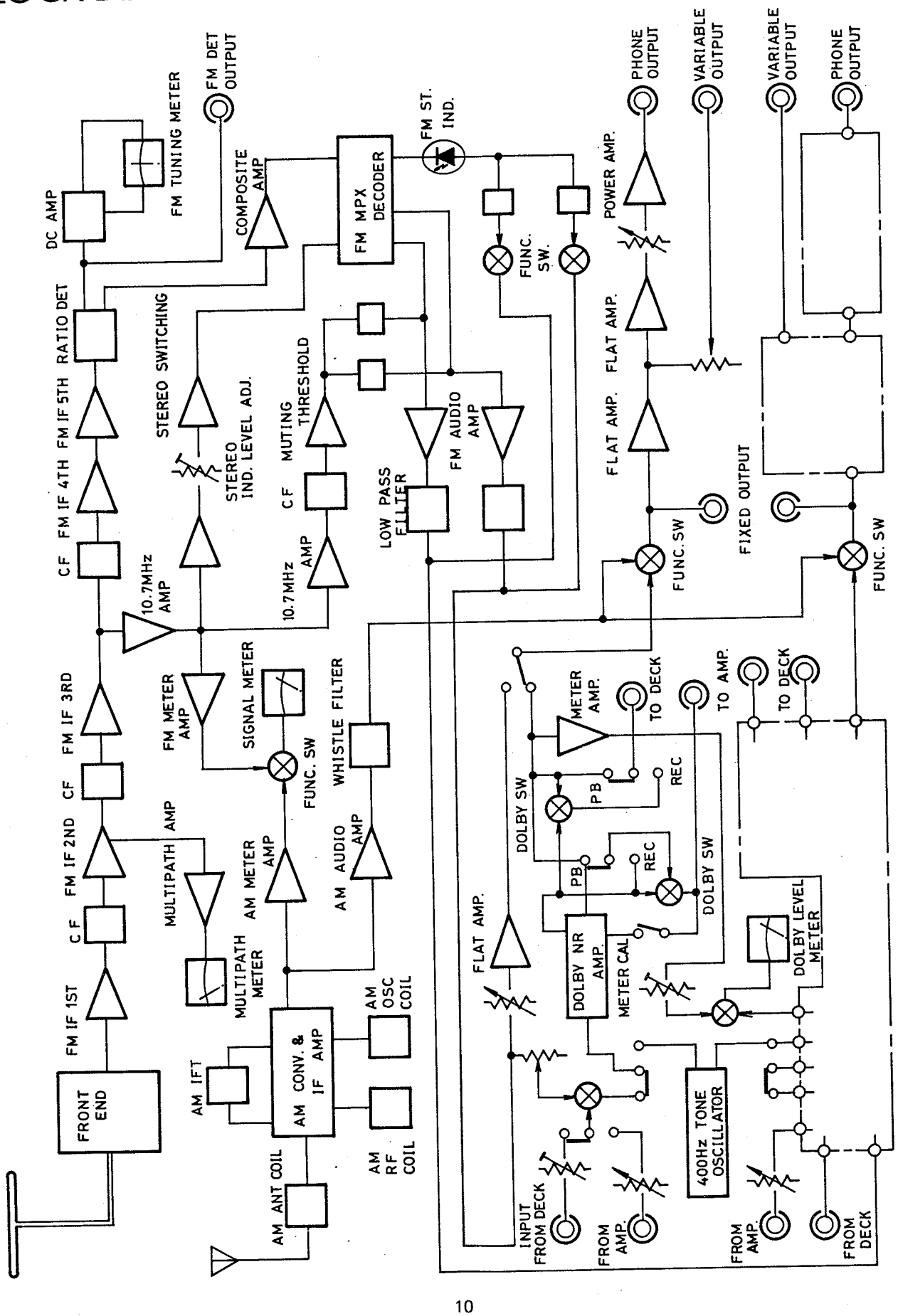
C. 400Hz Tone Calibration is not effective.
   1. Transistor Q701 or 702 may be faulty, or
   2. Calibration switch may be faulty.

DIAL STRINGING DIAGRAM

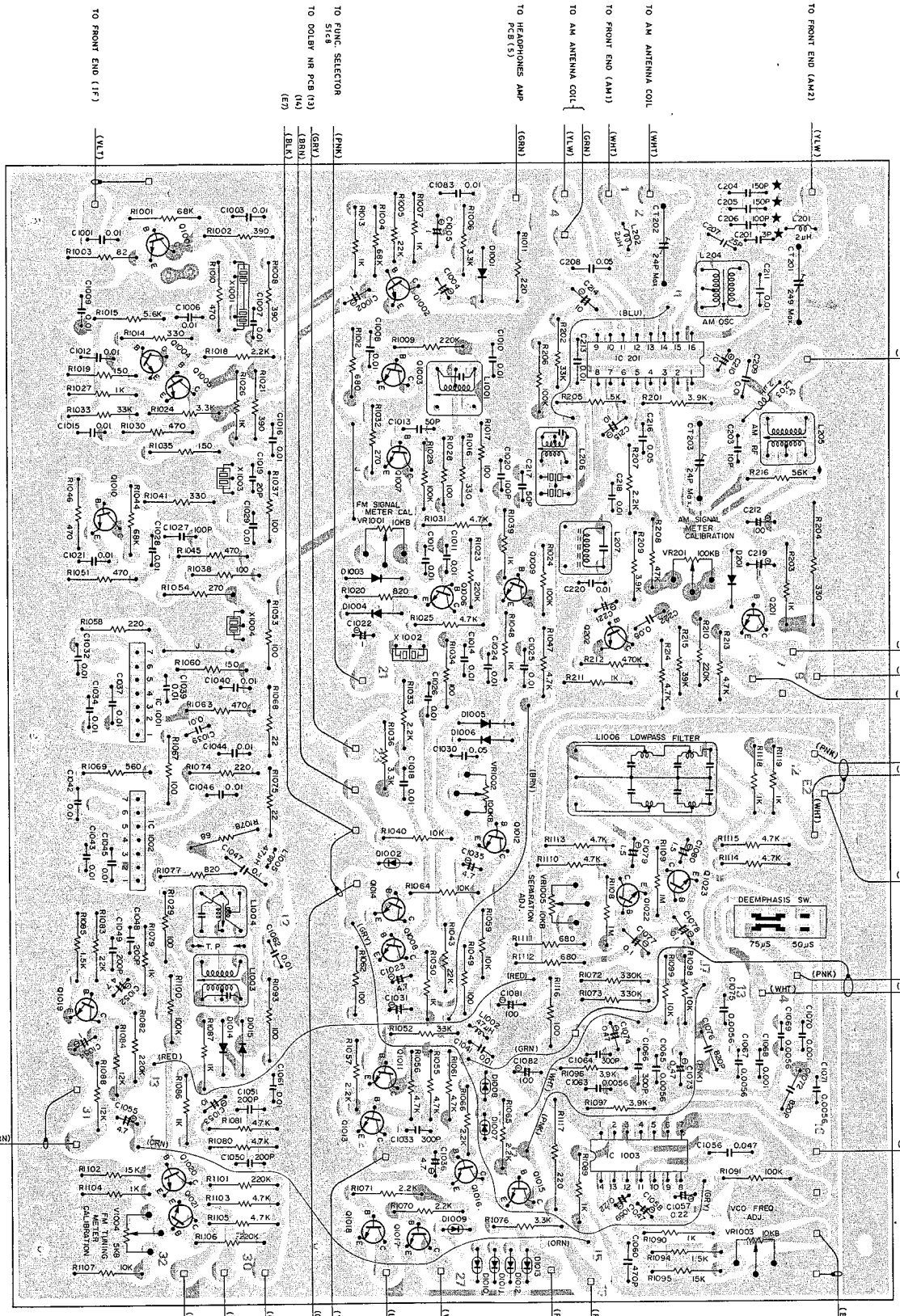


Note:
Carry out stringing with the front end set at VC maximum.

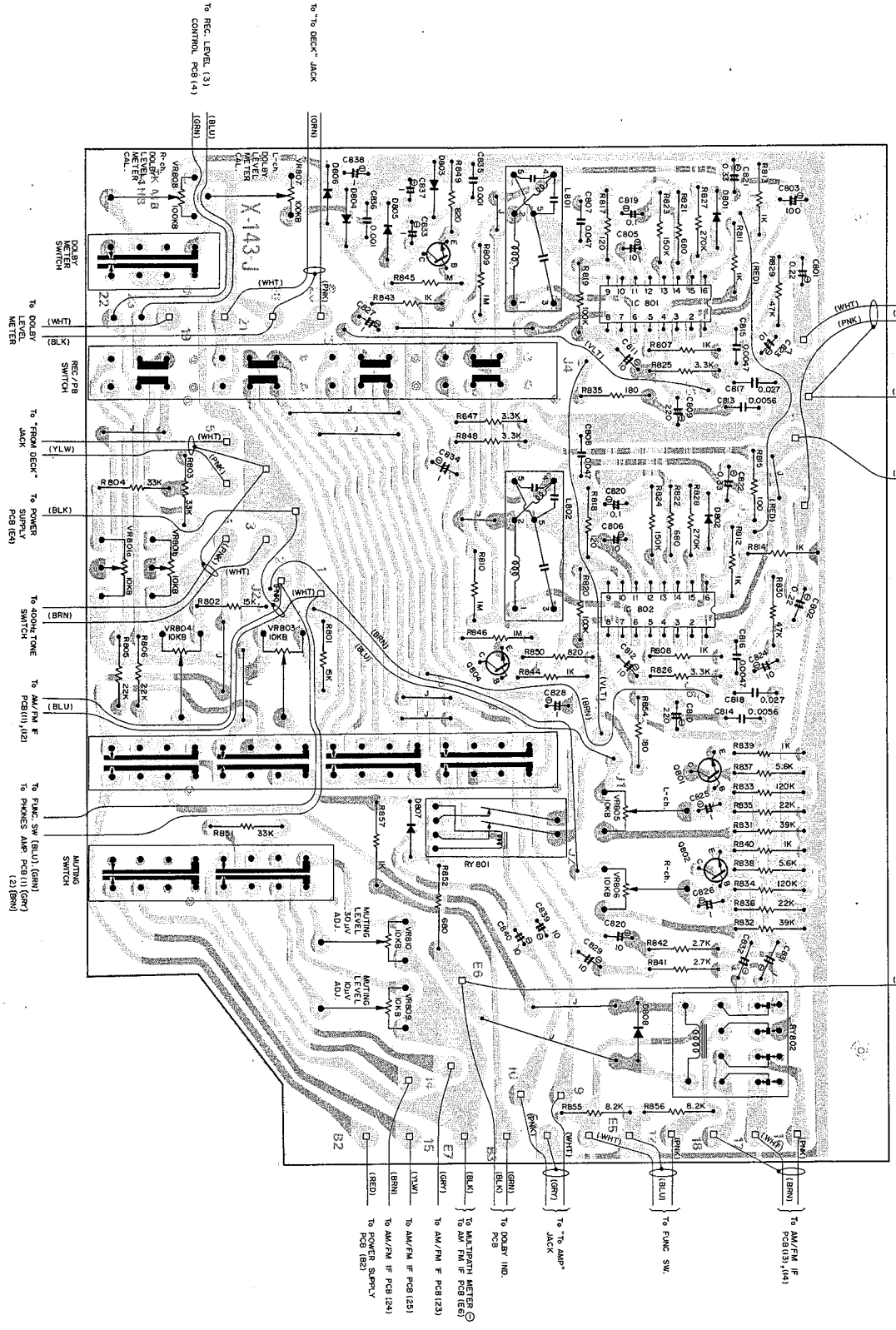
BLOCK DIAGRAM



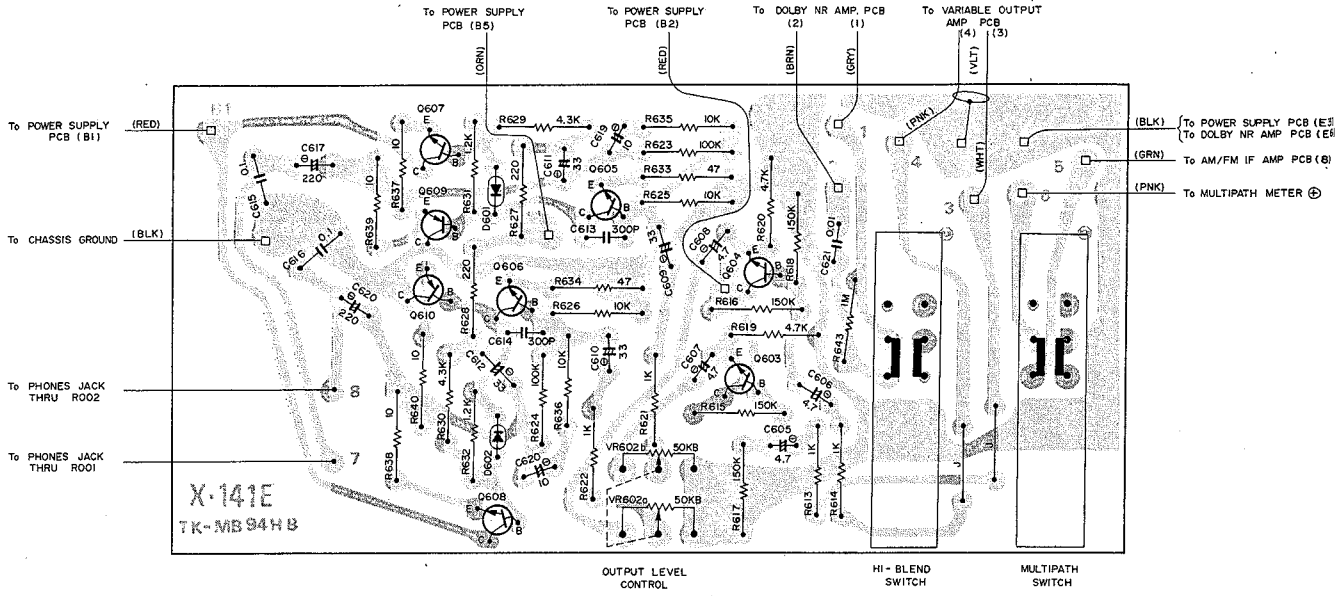
AM/FM IF & MPX CIRCUIT BOARD DIAGRAM



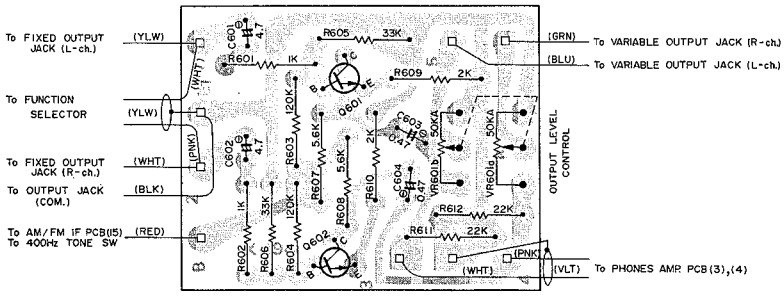
DOLBY NR AMP CIRCUIT BOARD DIAGRAM


To REC. LEVEL (3) CONTROL PCB (4)
To "To DECK" JACK
To FUNC SW.
To POWER SUPPLY PCB (E4)
To POWER SUPPLY PCB (E3)
To DOLBY LEVEL METER
To "FROM DECK" JACK
To POWER SUPPLY PCB (E4)
To 400Hz TONE SWITCH
To AM/FM IF PCB(11),(12)
To FUNC SW (BLU) (GRN) (GRY)
To PHONES AMP. PCB(11) (21) (BRN)
To CHASSIS GROUND
To "To AMP" JACK
To DOLBY IND. PCB
To MULTIPATH METER (E6)
To AM/FM IF PCB (23)
To AM/FM IF PCB (25)
To AM/FM IF PCB (24)
To POWER SUPPLY PCB (B2)
To AM/FM IF PCB(13),(14)
DOLBY METER SWITCH
REC/PB SWITCH
MUTING SWITCH
IC 801
IC 802
RY 801
RY 802
MUTING LEVEL 30 µV ADJ.
MUTING LEVEL 10 µV ADJ.

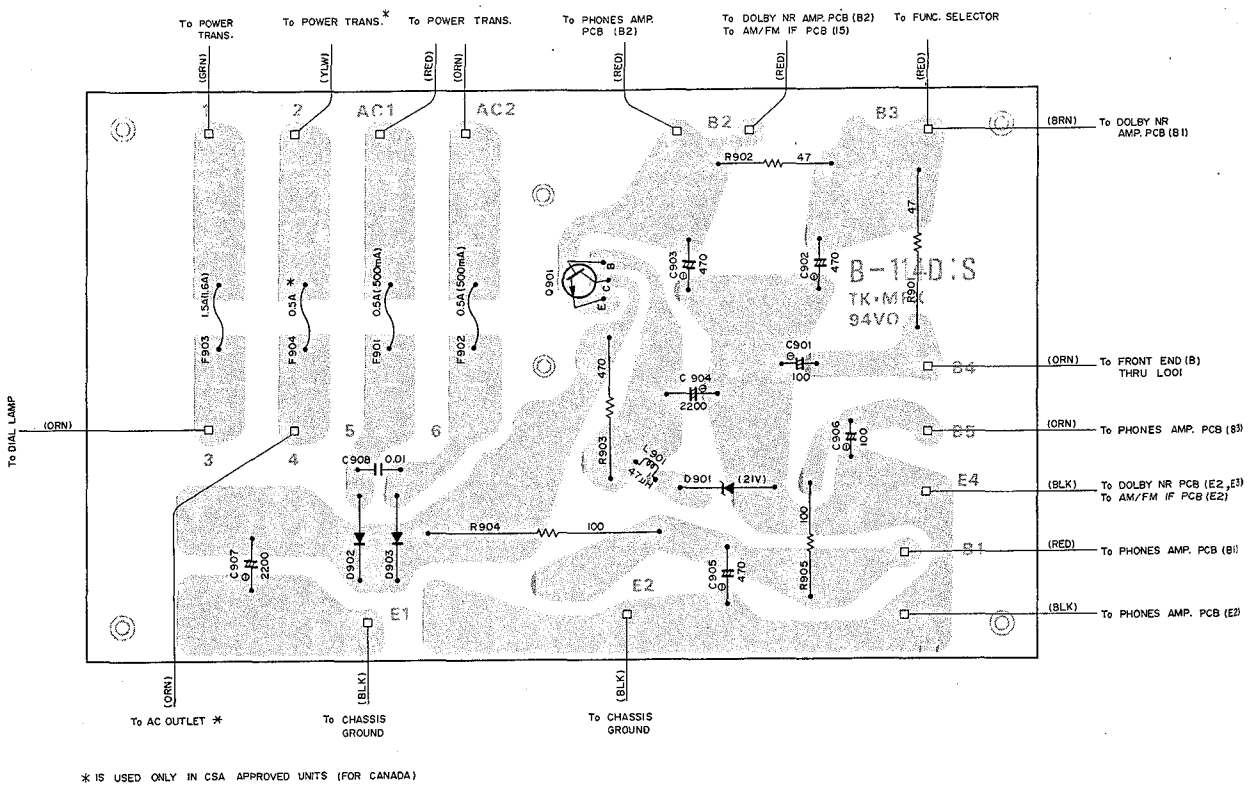
PHONES AMP CIRCUIT BOARD DIAGRAM


To POWER SUPPLY PCB (B5)
To POWER SUPPLY PCB (B2)
To DOLBY NR AMP. PCB (2) (1)
To VARIABLE OUTPUT AMP PCB (4) (3)
To POWER SUPPLY PCB (B1)
(RED)
To CHASSIS GROUND
(BLK)
To PHONES JACK THRU R002
To PHONES JACK THRU R001
(BLK) To POWER SUPPLY PCB (E3)
To DOLBY NR AMP PCB (E6)
(GRN) To AM/FM IF AMP PCB (8)
(PNK) To MULTIPATH METER
X-141E
TK-MB94HB
OUTPUT LEVEL CONTROL
HI-BLEND SWITCH
MULTIPATH SWITCH

VARIABLE OUTPUT AMP CIRCUIT BOARD DIAGRAM

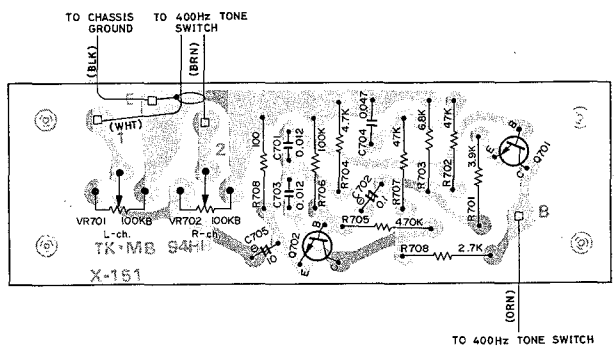


POWER SUPPLY CIRCUIT BOARD DIAGRAM



* IS USED ONLY IN CSA APPROVED UNITS (FOR CANADA)

400Hz TONE OSCILLATION CIRCUIT BOARD DIAGRAM

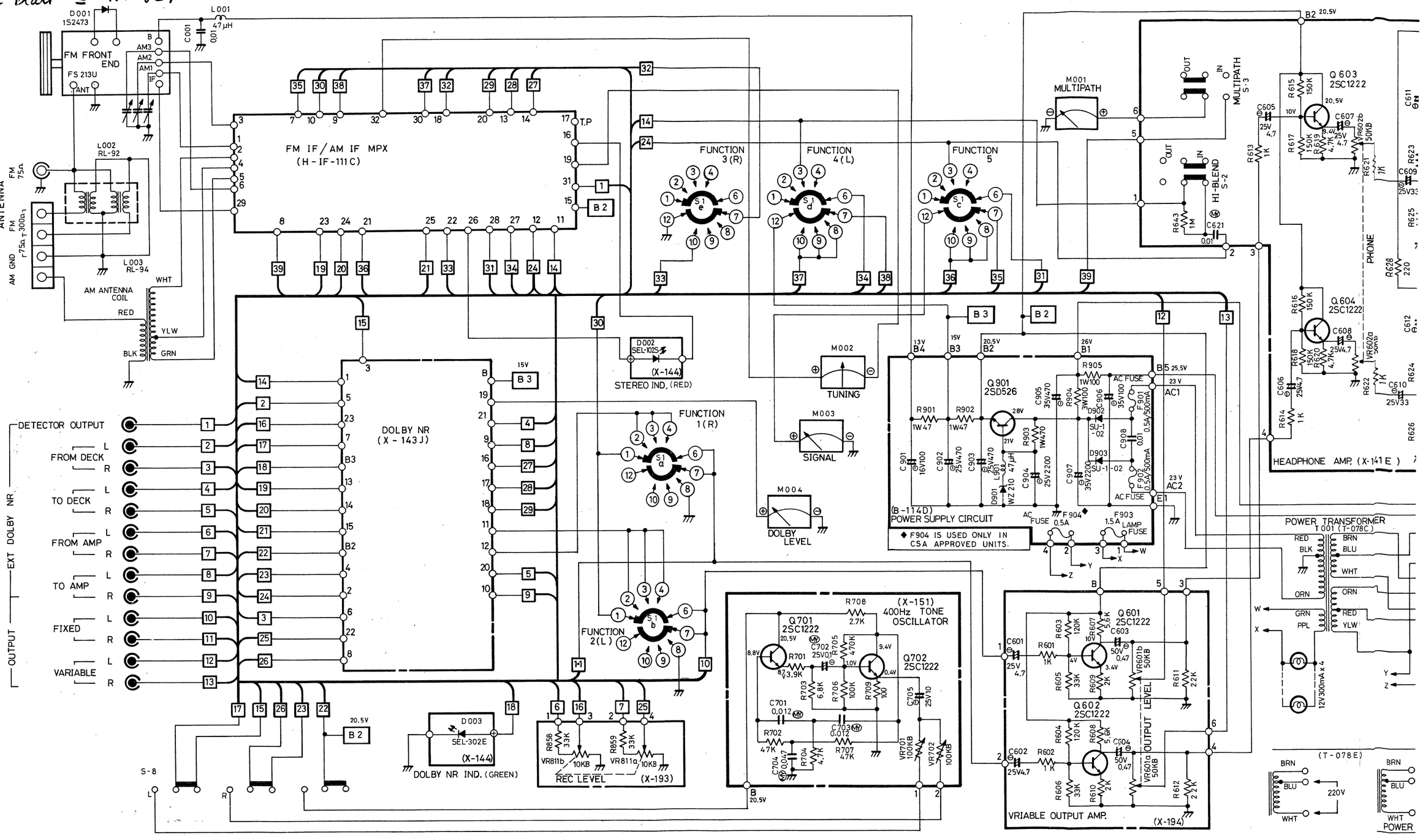


SCHEMATIC DIAGRAM

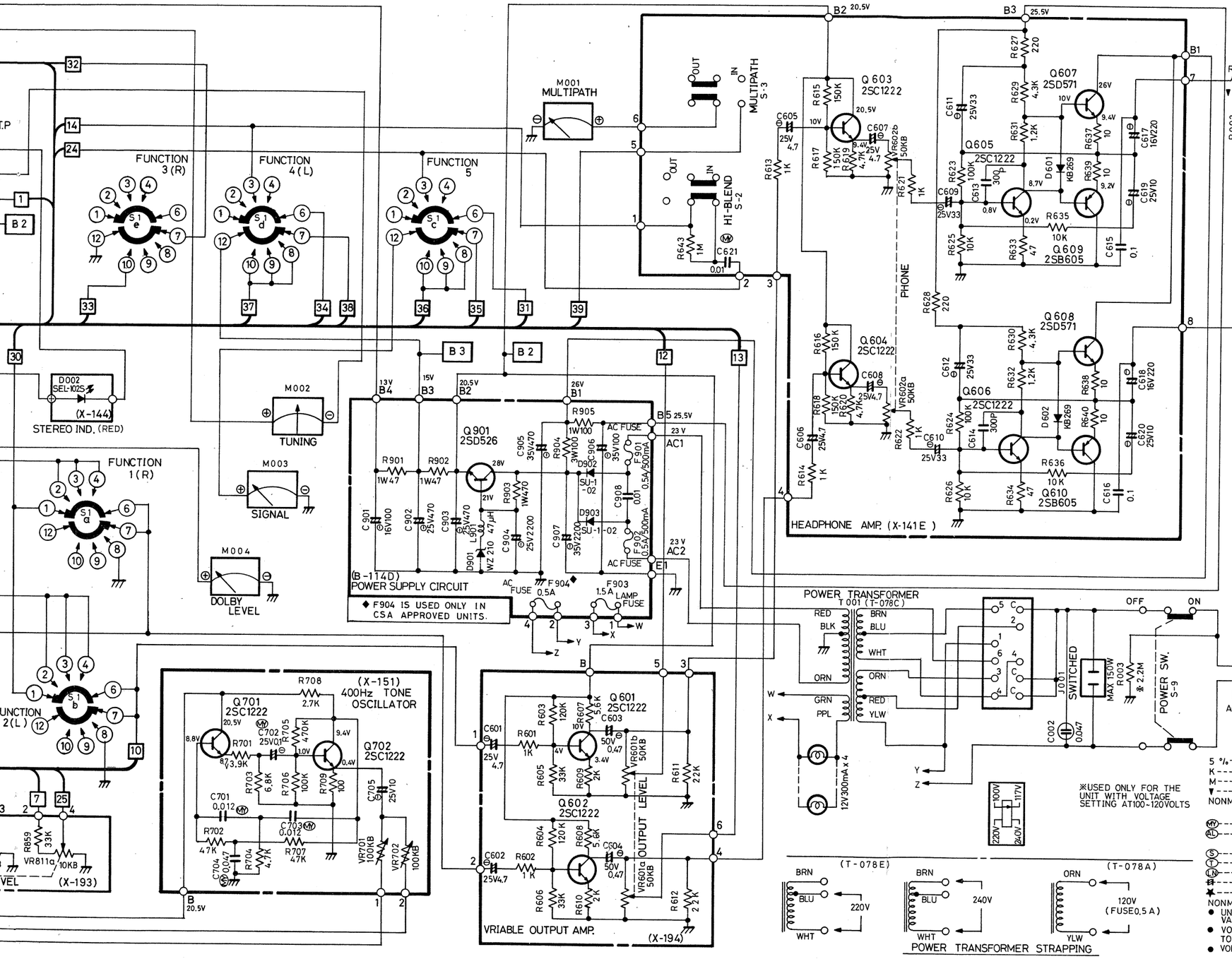
This Schematic Diagram is applicable to the units with following Serial Nos. and onward.

Serial No. NA 26631 ~
R 27251 ~

Tuner Plan ≅ RT 824



MODEL RT-1024 SCHEMATIC DIAGRAM



ITEM	SCHMATIC LOCATION	LAST
VRIABLE OUTPUT AMP.	R612	C604
HEADPHONE AMP.	R643	C621
400Hz TONE OSCILLATOR	R709	C705
RCE LEVEL CONTROL CIRCUIT	R859	——
POWER SUPPLY CIRCUIT	R905	C908
CHASSIS	R003	C002

RESISTORS

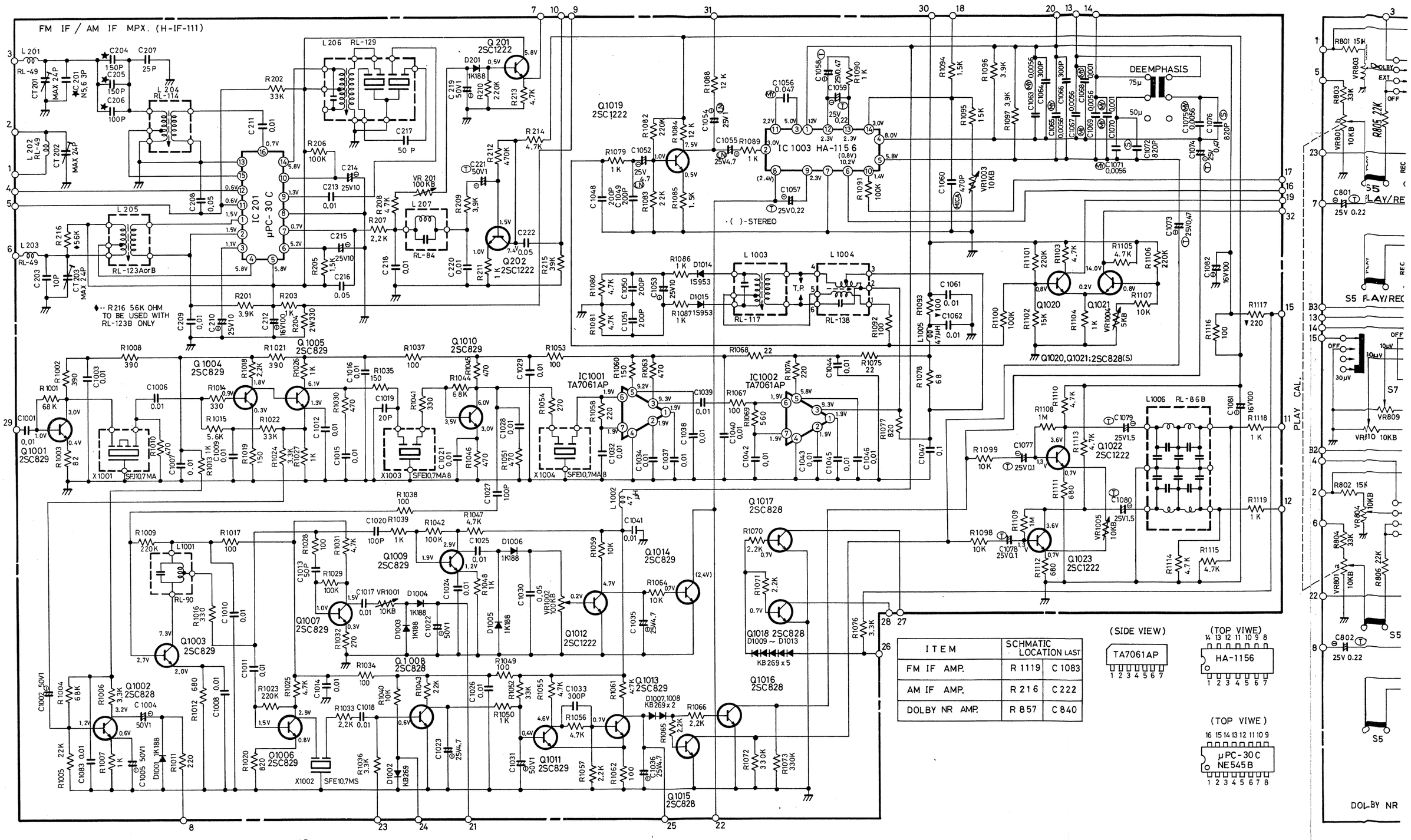
5 %--- TOLERANCE UNLESS OTHERWISE NOTED.
K----- KILO OHM.
M----- MEGA OHM.
▼----- COMPOSITON RESISTORS 1/2 WATT.
NONMARK--- LOW NOISE TYPE CARBON RESISTORS 1/4 WATT.

CAPACITORS

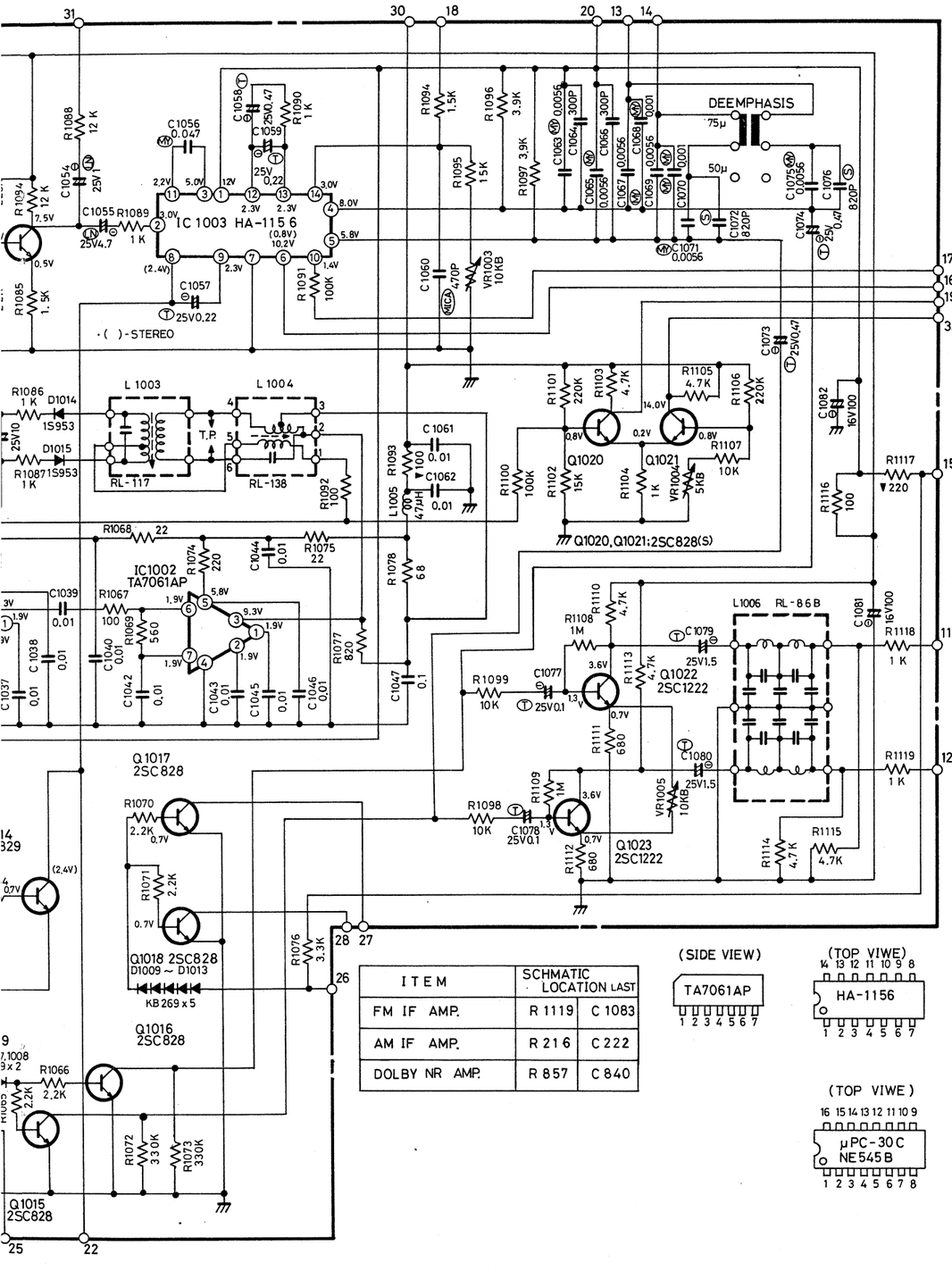
(MY)--- MYLAR FILM CAPACITORS.
(AL)--- SINTERED ALUMINUM SOLID ELECTROLYTIC CAPACITORS (ALSICON).
(S)---- POLYSTYRENE FILM CAPACITORS.
(T)---- TANTALUM CAPACITORS.
(LN)---- LOW NOISE TYPE CAPACITORS.
---- ELECTROLYTIC CAPACITORS.
---- TEMPERATURE COEFFICIENT CAPACITORS.
NONMARK--- CERAMIC CAPACITORS.

- UNLESS OTHERWISE NOTED IN SCHEMATIC ALL CAPACITANCE VALUES ARE EXPRESSED IN MFD.
- VOLTAGE READING WITH VTVM FROM THE POINT SHOWN TO THE CHASSIS GROUND (LINE VOLTAGE 120 VOLT).
- VOLTAGE READING MAY VARY ±20 %.

SCHEMATIC DIAGRAM



ITEM	SCHMATIC LOCATION LAST	
FM IF AMP.	R 1119	C 1083
AM IF AMP.	R 216	C 222
DOLBY NR AMP.	R 857	C 840

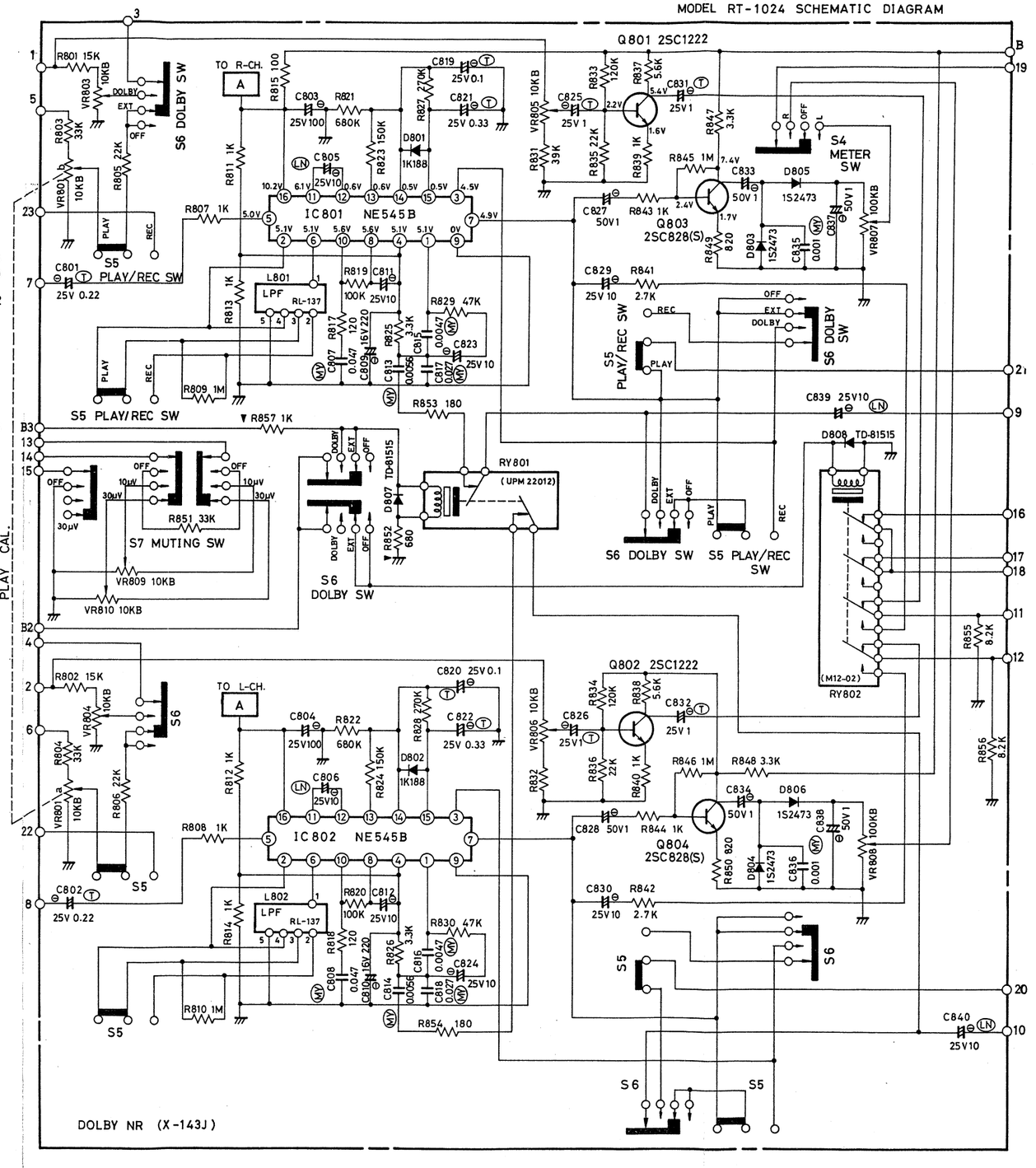


ITEM	SCHMATIC LOCATION	LAST
FM IF AMP.	R 1119	C 1083
AM IF AMP.	R 216	C 222
DOLBY NR AMP.	R 857	C 840

(SIDE VIEW)

(TOP VIWE)

(TOP VIWE)



REPAIR PARTS LIST

Schematic Location	Part No.	Description
TRANSISTORS, DIODES AND IC's		
Q1001, 1003, 1004, 1005, 1006, 1007, 1009, 1010, 1011, 1013, 1014	301201117	2SC829 (C), FM IF Amp., Muting, etc.
Q1002, 1008, 1015, 1016, 1017, 1018	301201115	2SC828 (R), Multipath, Muting, etc.
Q1019, 1022, 1023, 201, 202, 601, 602, 603, 604, 605, 606, 701, 702, 801, 802	301201156	2SC1222, FM MPX Amp., Dolby NR Amp., Headphones Amp., etc.
Q1020, 1021, 803, 804	301201149	2SC828 (S), FM Tuning Meter Amp., etc.
Q607, 608	301301134	2SD571, Headphones Amp.
Q609, 610	301101123	2SB605, Headphones Amp.
Q901	301301132	2SD526, Stabilizer
IC1001, 1002	303452146	TA7061AP, FM IF Amp.
IC1003	303452151	HA-1156, FM MPX Decoder
IC201	303452157	μPC30C, AM Conv. & IF Amp.
IC801, 802	303452161	NE545B, Dolby NR Amp.
D1001, 1003, 1004, 1005, 1006, 201, 801, 802	300111008	1K188, FM Meter Rect. AM Meter Rect., etc.
D1002, 1007, 1008, 1009, 1010, 1011, 1012, 1013, 601, 602	300212004	KB-269, Muting Bias, etc.
D1014, 1015	300111011	1S953, FM Det.
D803, 804, 805 806, 807, 808, 001	300111010	1S2473 or TD-81515 (30011012), Dolby Meter Rect.
D901	300313016	WZ-210, Zener 21V
D902, 903	300919008	SM-01-02, Rect.
D002	300414005	SEL-102S, FM Stereo Ind.
D003	300414010	SEL-302E, Dolby NR Ind.
VARIABLE RESISTORS		
VR1001, 1003, 1005	510502126	10KB, FM Signal Meter Cal., MPX VCO Adj., FM Stereo Separation Adj.
VR1002, 201, 701, 702	510502130	100KB, FM Stereo Ind. Level Adj., 400Hz Tone Level Adj.
VR1004	510502128	5KB, FM Tuning Meter Cal.
VR601	525101127	50KA x 2, Output Level Control
VR602	525101139	50KB x 2, Headphones Volume Control
VR801, 811	525101141	10KB x 2, Play Cal., Rec. Level Control
VR803, 804, 805 806, 809, 810	510502153	10KB, Dolby Level Cal., Muting Level Adj.
VR807, 808	510502155	100KB, Dolby Meter Cal.

Schematic Location	Part No.	Description
COILS AND TRANSFORMERS		
L1001	226501122	FM IFT, 10.7MHz Tune
L1002, 1005, 901 001	226501123	RF Choke, 47μH
L1003	225501130	FM Disc. (Sec.)
L1004	225501133	FM Disc. (Pri.)
L1006	228641118	MPX Low Pass Filter
L201, 202, 203	226501124	RF Choke, 2μH
L204	223301131	AM OSC Coil
L205	226501130	AM RF Coil
L206	229101183	AM IFT, 455kHz Tune
L207	228641119	AM Whistle Filter
L801, 802	228641134	Dolby NR Low Pass Filter
L002	226501121	FM Antenna Matching Trans.
L003	222391130	AM Antenna Coil
T001	205001414	Power Transformer (Multi-voltage)
	206001414	Power Transformer (220V-240V)
	201001414	Power Transformer (120V only)
SWITCHES		
S1	601011286	Function Selector
S2, 3	611001641	Hi-Blend, Multipath
S4	611001637	Dolby Meter
S5	611001646	Play/Rec.
S6	611001643	Dolby Source Selector
S7	611001638	Muting Level Selector
S8	613000029	400Hz Tone
S9	614010118	Power Supply
S10	613000023	FM Deemphasis
OTHERS		
X1001	229101166	FM IF Bandpass Filter
X1002	229101184	FM IF Bandpass Filter
X1003, 1004	229101171	FM IF Bandpass Filter
M001	231310065	Multipath Meter
M002	231310064	FM Tuning Meter
M003	231310063	Signal Meter
M004	231310066	Dolby Level Meter
	321304383	AM/FM Front End
CT201, 202, 203	490110115	Trimmer Capacitor, 24pF Max.
RY801	240111228	Relay, DC12V
RY802	240111230	Relay, DC24V
	352126030	Lamp, 12.6V, 0.3A Dial Light
	141310366	IF Amp. Circuit Board Ass'y
	141810677	Dolby NR Amp. Circuit Board Ass'y
	141810656	400Hz Tone OSC Circuit Board Ass'y
	141810678	Variable Output Amp. Circuit Board Ass'y
	141810679	Headphones Amp. Circuit Board Ass'y
	141810676	Rec. Level Control Circuit Board Ass'y
	141810659	Power Supply Circuit Board Ass'y